

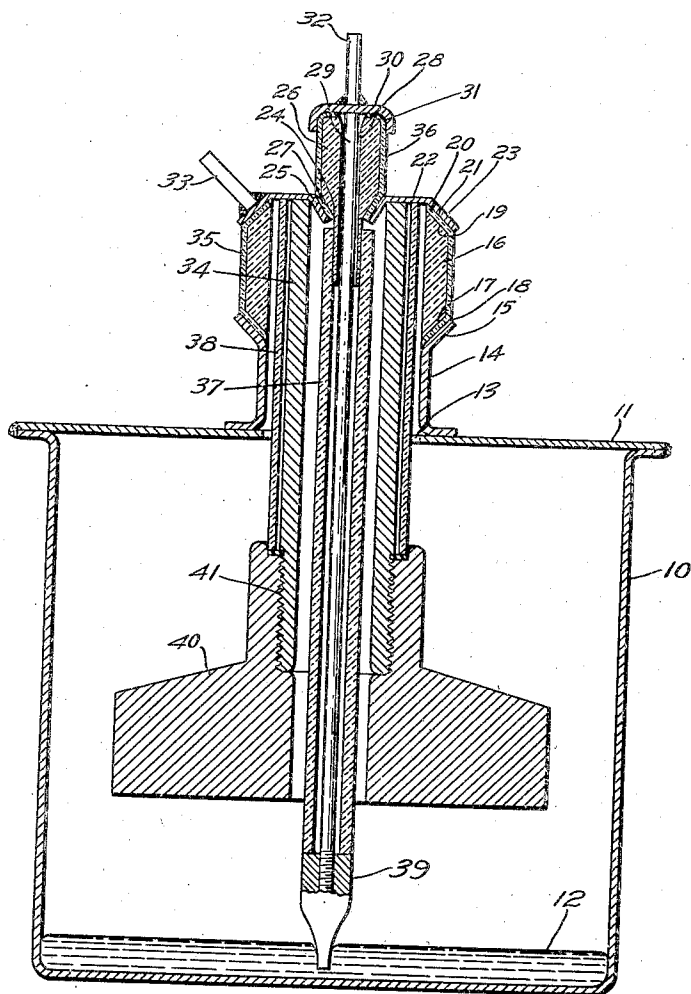
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W. E. BAHL'S

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VACUUM-TIGHT INSULATED LEAD-IN STRUCTURE

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WITNESSES:

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STRUCTURE

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Original application October 21, 1936, Serial No.
106,798. Divided and this application February
20, 1937, Serial No. 126,881

3 Claims. (Cl. 250—27.5)

My invention relates to a vacuum-tight insu-
lated lead-in construction and especially such
construction applied to electron discharge de-
vices.

This application is a divisional application of
my copending application, Serial No. 106,798,
filed October 21, 1936, for Vacuum-tight insulated
lead-in structures.

An object of my invention is to provide a very
strong vacuum-tight lead-in construction that
will withstand a great difference of pressure on
opposite sides thereof.

Another object of my invention is to provide a
construction that will permit a plurality of in-
sulated lead-ins through an opening in a vacuum-
tight metal casing.

Other objects and advantages of my invention
will become apparent from the following descrip-
tion and the drawing, in which:

The single figure is a view, principally in cross-
section, of a discharge device incorporating my
invention.

In the prior art devices employing seals be-
tween lead-ins and metal containers, glass has
been heretofore utilized. In such constructions,
principally that of vacuum electron discharge
tubes, it is necessary that the device be heat
treated at a very high temperature in order to
degasify the interior elements. An extensive por-
tion of a glass wall cannot be utilized with such
heat treatment because the glass will become
molten and collapse. On the other hand, if not
much glass is used, there is apt to be a very short
distance between the lead-in and the metal wall
of the container that will provide a leakage path
with the accumulation of dirt and moisture.

It is an object of my invention to utilize a
ceramic material for the body of insulating ma-
terial and to utilize a coating of glass to seal the
ceramic material to the metal casing.

In particular, I desire to provide a vacuum-
tight lead-in construction wherein a plurality
of lead-ins may extend through an opening in a
metal casing, but insulated from one another,
and yet form a strong structure that will with-
stand a considerable difference of pressure on
the exterior and interior thereof.

In the figure, I have illustrated a casing 10
having a cover portion 11. In this specific em-
bodiment, the casing 10 contains a body of mer-
cury 12 which forms the cathode of this particu-
lar discharge device. The casing 10 has an open-
ing 13 and about this opening is a tubular ex-
tension 14. While I have illustrated the casing
10, cover 11 and tubular extension 14 as separate

parts, which are welded together in vacuum-
tight arrangement, yet these parts may be inte-
gral with each other or parts thereof, if de-
sired.

I prefer to make the casing parts 10 and 11 of
steel or iron, and to make the tubular extension
14 of an alloy 24% to 30% nickel, 5% to 25%
cobalt, less than 1% manganese, and the remain-
der principally or essentially iron.

The tubular extension 14 is preferably an out-
wardly extending flange 15 with a preferably con-
ical out flare. Seated on this conical extension
15 is an insulator 16, preferably of hollow porce-
lain. The adjacent face 17 of this insulator is
sealed to the conical extension 15 by a coating
of glass 18. This glass is preferably of the boro-
silicate type having a major percentage of silic-
on dioxide in a preferred range of 65% to 75%.
This glass has preferably less than 10% PbO,
less than 6% Al₂O₃, and 10% to 25% B₂O₃.
The particular type of glass that I prefer to use
has the following analysis:

	Percent
SiO ₂	67.3
B ₂ O ₃	24.6
Al ₂ O ₃	1.73
Na ₂ O	4.6
K ₂ O	.94
As ₂ O ₃	.14

The upper surface of the porcelain member
16 preferably has a conical contour 19 that is in
turn sealed by glass or glaze 20 to the under sur-
face 21 of a metal member 22 having a down-
wardly extending flange 23 similar in contour
at its outer end to the conical contour 19 of this
layer. The metal member 22 about this central
opening 24 preferably has a downwardly extend-
ing flange 25, preferably in conical shape. Seat-
ed on this flange 25 is a second insulator
26 having a conical contour 27 sealed to the flange
25 by means of glass previously described. The
insulator 26 preferably has a central opening 28
and a lead-in conductor 29 extending there-
through to the interior of the metal casing 10.
A second metal member 30 preferably extends
over the top of the insulator 26 and is sealed to
the top thereof at 31 by the glass previously de-
scribed. The lead-in conductor 29 is, of course,
preferably welded to the under surface of the
metal member 30. An exterior connection 32
may be welded to the exterior portion of the
metal member 30 and another lead or connection
33 welded to the other metal member 22.

I prefer to secure, by welding, a tubular lead-in

to the under side of the metal closure member 22 extending through to the interior of the metal casing. The tubular lead-in 34 is preferably concentric with the centrally disposed conductor 29. The exposed surfaces 35 and 36 of the two porcelain insulators may likewise be covered with a glass or glaze, as previously described.

Where this construction is used for a discharge device, I prefer to surround the central lead-in conductor 29 with an insulating sleeve 37 and to also surround the tubular lead-in 34 with another sleeve 38. These insulating sleeves are preferably of quartz.

In the particular device described, I prefer to attach an auxiliary or igniting electrode 39 to the lower end of the central conductor 29. This igniting electrode is preferably of the make-alive type having a contact of high resistance material with the mercury pool.

The other lead-in 34 is preferably connected to an anode 40 surrounding the central lead-in and preferably concentric thereto. This anode is preferably supported by a screw-threaded joint 41 to the tubular lead-in 34.

Where the glass is used for sealing purposes, I prefer to utilize the boro-silicate type of glass previously described, and where metal is sealed by means of the glass, I prefer to use the nickel-cobalt-iron alloy also previously described, because these substances have a similar coefficient of expansion substantially in the region of 4.6 to 7.0×10^{-6} centimeters per degree centigrade. I also desire to utilize ceramic material such as porcelain of a substantially similar coefficient of expansion for the insulators. One such type of porcelain is composed of 30% feldspar, 25% flint and 40% clay. A typical analysis of a particular type of this porcelain known as "Derry plastic body" gives:

	Per cent
SiO ₂	70.07
Al ₂ O ₃	23.15
Fe ₂ O ₃	0.39
TiO ₂	0.76
CaO.....	0.12
MgO.....	0.14
Na ₂ O.....	1.09
K ₂ O.....	3.30

The specific composition of the porcelain may be varied, as for instance I have substituted pyrophyllite for the flint in the porcelain previously described.

Although I have shown and described the invention applied to a discharge tube of a particular type, many other applications of my inven-

tion are possible to other types of discharge tubes and to other applications. Such other applications include bushing or lead-ins for condensers, especially where such bushings must be oil or air-tight, electrical lead-ins for hermetically sealed refrigerators, lead-in bushings for sealed oil-filled transformers, lead-ins for motors having a special cooling atmosphere as hydrogen, etc. This list is to be taken as illustrative and not as a limiting list.

Also, although I have described a specific modification of my invention, various changes may be made in the shape, arrangement, selection and application of the various elements and combination disclosed. I, accordingly, desire only such limitations to be placed on the following claims as is necessitated by the prior art.

I claim as my invention:

1. An electrical lead-in construction comprising a metal casing portion having an opening, a hollow insulator sealed at one end to the casing about said opening, a metallic member sealed to the other end of said hollow insulator and having an opening in alignment with the hollow of the insulator, said metallic member having a flared portion about said opening, a second hollow insulator having a portion corresponding in contour with said flared portion, sealing means sealing said corresponding portions together vacuum-tight and conductor structure sealed to and extending through said second hollow insulator.

2. An electrical lead-in construction comprising a metallic casing portion having an opening, a hollow insulator sealed at one end to the casing about said opening, a metallic member sealed to the other end of said hollow insulator and having a portion projecting within said hollow insulator, a second hollow insulator having a portion projecting within said first hollow insulator, said last mentioned projecting portions being sealed to each other and conductor structure sealed to and extending through said second hollow insulator.

3. An electrical lead-in construction comprising a metallic casing portion having a projection about an opening, said projection having a flared end portion, a hollow insulator sealed at one end to said flared end portion, a metallic member having a flared edge portion sealed to the other end of said hollow insulator and having an opening with a flared edge, a second hollow insulator having one end sealed to said last mentioned flared edge and conductor structure sealed to the other end of said second insulator.

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